



Managing Firmware Upgrades

This section describes managing firmware upgrade settings in IoT FND, and includes the following sections:

Use IoT FND to upgrade the firmware running on routers (CGR1000s, IR800s), AP800s and Cisco Resilient Mesh Endpoints (RMEs) such as meters and range extenders. IoT FND stores the firmware binaries in its database for later transfer to routers in a firmware group through an IoT FND and IoT-DM file transfer, and to RMEs using IoT FND.

Cisco provides the firmware bundles as a zip file. For Cisco IOS, software bundles include hypervisor, system image and IOx images (for example, Guest-OS, Host-OS).

Firmware system images are large (approximately 130 MB); kickstart images are approximately 30 MB. Every firmware bundle includes a manifest file with metadata about the images in the bundle. You can pause, stop, or resume the upload process.

- [Router Firmware Updates, on page 1](#)
- [Working with Resilient Mesh Endpoint Firmware Images, on page 4](#)
- [AP800 Firmware Upgrade During Zero Touch Deployment, on page 12](#)
- [Configuring Firmware Group Settings, on page 14](#)
- [Working with Router Firmware Images, on page 19](#)
- [Support for Wi-SUN Stack Switch, on page 25](#)
- [Upgrading Firmware Image during Bootstrapping, on page 33](#)
- [Skipping Firmware Upgrades during PNP, on page 34](#)

Router Firmware Updates

IoT FND updates router firmware in two steps:

Step 1 Uploads the firmware image from IoT FND to the router. Firmware images upload to the flash:/managed/images directory on the router.

Note In some cases the router might be in a Firmware Group. Refer to [Configuring Firmware Group Settings, on page 14](#).

Because of their large size, firmware-image uploads to routers take approximately 30 minutes, depending on interface speeds

Note If you set the property, `collect-cellular-link-metrics`, to `'true'` in `cgms.properties`, then the following Cellular link quality metrics are collected for CGR1000, IR800 and IR1100, each time you initiate a firmware upload from IoT FND:

- RSRP: Reference Signal Received Power which is the power of the reference signal
- RSRQ: Reference Signal Received Quality or the quality of the reference signal which is the a ratio of RSSI to RSRP
- SINR: Signal-to-Noise Ratio which compares the strength of the signal to the background noise.
- RSSI: Received Signal Strength Indicator or the strength of the reference signal

Additionally, the following `cgna` profile is created on the CGR1240 and activated when the firmware upload is triggered.

```
cgna profile cg-nms-cellularlinkmetrics
add-command show cellular 3/1 all | format
flash:/managed/odm/cg-nms.odm
interval 5
url https://<FND IP address>:9121/cgna/ios/metrics
gzip
active
```

Note On execution of the `cgna` profile above, the metrics data is persisted in the `Metrics_History` table in the database and can be collected by using the `getMetricHistory` NBAPI.

Step 2 Installs the firmware on the device and reloads it.

During the firmware install the boot parameters on the routers are updated according to the new image file and the router is reloaded after enabling the `cg-nms-register` `cgna` profile.

Note You must initiate the firmware installation process. IoT FND does not automatically start the upload after the image upload.

When a router contacts IoT FND for the first time to register and request tunnel provisioning, IoT FND rolls the router back to the default factory configuration (`ps-start-config`) before uploading and installing the new firmware image.

Note This rollback requires a second reload to update the boot parameters in `ps-start-config` and apply the latest configuration. This second reload adds an additional 10–15 minutes to the installation and reloading operation.

Upgrading Guest OS Images

Depending on CGR factory configuration, a Guest OS (GOS) may be present in the VM instance. You can install or upgrade Cisco IOS on the **CONFIG > FIRMWARE UPDATE** page (see [Router Firmware Updates, on page 1](#)). The GOS, hypervisor, and Cisco IOS all upgrade when you perform a Cisco IOS image bundle installation or update.

After any Cisco IOS install or upgrade, when IoT FND discovers a GOS, it checks if the initial communications setup is complete before it performs the required setup. The CGR must have a DHCP pool and GigabitEthernet 0/1 interface configured to provide an IP address and act as the gateway for the GOS. The new GOS image overwrites existing configurations. IoT FND has an internal backup and restore mechanism that ports existing apps to the upgraded Guest OS. See [Monitoring a Guest OS](#) for more information.

See [Cisco 1000 Series Connected Grid Routers Configuration Guides](#) for information on configuring the CGR.

Note: If IoT FND detects a non-Cisco OS installed on the VM, the firmware bundle will not upload and the Cisco reference GOS will not install.

Upgrading WPAN Images

At the **CONFIG > FIRMWARE UPDATE** page, you can upload the independent WPAN images (IOS-WPAN-RF, IOS-WPAN-PLC, IOS-WPAN-OFDM, IOS-WPAN-IXM) to IoT FND using the Images sub-tab (left-hand side) and Upload Image button like other image upgrades. This process is known as a non-integrated WPAN firmware upgrade.

Note: The WPAN firmware image integrated with the IOS CGR image option is still supported.

Also, if only the WPAN firmware upgrade from the image bundled with IOS image is desired (for example, when the WPAN firmware upgrade option was not checked during IOS upgrade), the “Install from Router” option is also provided under respective WPAN image types (IOS-WPAN-RF or IOS-WPAN-PLC).

For detailed steps, go to [Working with Router Firmware Images, on page 19](#).

Changing Action Expiration Timer

You can use the `cgms_preferences.sh` script to set or retrieve the action expiration timer value in the IoT FND database:

```
/opt/cgms
/bin/cgms_preferences setCgrActionExpirationTimeout 50
```

Valid options are:

Step 1 `set <pkg>actionExpirationTimeoutMins<value>`

where:

- `<pkg>` is the preference package (required for `set` and `get` operations).
- `actionExpirationTimeoutMins` is the preference key (required for `set` and `get` operations).
- `<value>` is the preferred value, in minutes (required for `set` and `setCgrActionExpirationTimeout` operations).

Step 2 `setCgrActionExpirationTimeout <value>`

Step 3 `get <pkg>actionExpirationTimeoutMins`

Step 4 `getCgrActionExpirationTimeout`

Example

In the following example, the action timer value is retrieved, set, the current value retrieved again, the value removed, and a null value retrieved:

```
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
getCgrActionExpirationTimeout
2013-08-12 22:38:42,004:INFO:main:CgmsConnectionProvider: registered
the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
5
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
setCgrActionExpirationTimeout 50
2013-08-12 22:38:51,907:INFO:main:CgmsConnectionProvider: registered
```

```

the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
Successfully set the preferences.
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
getCgrActionExpirationTimeout
2013-08-12 22:38:58,591:INFO:main:CgmsConnectionProvider: registered
the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
50
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
set com.cisco.cgms.elements.ciscocgr actionExpirationTimeoutMins
2013-08-12 22:39:12,921:INFO:main:CgmsConnectionProvider: registered
the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
50
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
set com.cisco.cgms.elements.ciscocgr actionExpirationTimeoutMins 15
2013-08-12 22:39:23,594:INFO:main:CgmsConnectionProvider: registered
the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
Successfully set the preferences.
[root@userID-lnx2 cgms]#./dist/cgms-1.x/bin/cgms_preferences.sh
set com.cisco.cgms.elements.ciscocgr actionExpirationTimeoutMins
2013-08-12 22:39:29,231:INFO:main:CgmsConnectionProvider: registered
the database url for CG-NMS: [jdbc:oracle:thin:@localhost:1522:cgms]
15

```

Working with Resilient Mesh Endpoint Firmware Images

This section describes how to add Resilient Mesh Endpoint (RME) firmware images to IoT FND, and how to upload and install the images on routers.

Overview

When you instruct IoT FND to upload a firmware image to the members of an RME firmware group or subnet, IoT FND pushes the image to the group members in the background and tracks the upload progress to ensure that the devices receive the image.

A Resilient Mesh Endpoint (RME) stores three firmware images:

- Uploaded image: Image most recently uploaded.
- Running image: Image that is currently operational.
- Backup image: It serves as a golden (fallback) image for the RME if there is an issue with the running image.



Note You can initiate up to 3 firmware downloads simultaneously.



Note IR500s and other RME devices can coexist on a network; however, for firmware management they cannot belong to the same group.





Note RME devices can report BL/Boot Loader image types to IoT FND, but IoT FND cannot upload boot loader images to devices.

Actions Supported and Information Displayed at the Firmware Management Pane

At the Firmware Management pane, you can filter the display by Subnet, PanID or Group when you are in the Devices tab.

For every image in the list, IoT FND displays the information as noted in the table:

Table 1: Image Information Displayed by IoT FND

Item	Description
Image	Image name.
Uploaded	Specifies the number of devices that uploaded the image. Click the number to display a list of these devices.
Running	Specifies the number of devices running this image. Click the number to display a list of these devices.
Backup	Specifies the number of devices using this image as a backup. Click the number to display a list of these devices.
Boot Loader	Specifies the boot loader image version.
LMAC	Specifies the LMAC image version.
BBU	Specifies the BBU image version.
Status	Specifies the status of the upload process.
Scheduled Reload	Specifies the scheduled reload time.
Actions	<p>Provides two actions:</p> <ul style="list-style-type: none"> • Schedule Install and Reload —Schedule the installation date and time of the loaded image and the reboot of the endpoint by selecting the Calendar icon.  <ul style="list-style-type: none"> • Set as Backup —Set the firmware backup image by selecting the clock icon with reverse arrow.  <p>See Setting the Installation Schedule, on page 6 for complete steps.</p>

Set a Firmware Backup Image

To set an image as a firmware image backup:

-
- Step 1** Click the Set as Backup button. (See the icon in the Actions summary in [Table 1: Image Information Displayed by IoT FND, on page 5](#)).
- Step 2** Click **Yes** to confirm backup.
-

Setting the Installation Schedule

To set the installation schedule for an image:

-
- Step 1** Click the **Schedule Install and Reload** button (Calendar icon). For more information, see [Table 1: Image Information Displayed by IoT FND, on page 5](#).

The following message appears if you try to schedule a reload operation for the node that is scheduled for stack switch operation.

Confirm



Stack switch operation is scheduled in subnet(s) spanning across groups. Are you sure you want to proceed ?

Yes

No

- Step 2** In the page that appears, specify the date and time for the installation of the image and rebooting of device.

Figure 1: Schedule and Install and Reload Page

Step 3 Click the **Set Reboot Time** button.

Firmware Update Transmission Settings

You can configure the Transmission Speed for pacing mesh firmware downloads at the Transmission Settings tab (See [CONFIG > FIRMWARE UPDATE](#) page).

Step 1 Select the Transmission Speed. Options are Slow (default), Medium, Fast or Custom.

The Slow setting is recommended as the initial setting. You can increase the Slow setting to Medium (or even Fast) if the following conditions exist:

- The slow setting does not cause any issues in the database and it is able to handle the workload presented without raising any alarms.
- There is a need to improve on the time taken to do the firmware download.

Step 2 Configure the minimum number of nodes necessary to enable the Multicast firmware upload.

Note For Custom Transmission Speed, you will have to specify Multicast Threshold, Unicast Delay and Minimum Multicast Delay values. Refer to the table below for the definitions of the terms on the [CONFIG > FIRMWARE UPDATE > Transmissions Settings](#) page.

Figure 2: CONFIG > FIRMWARE UPDATE

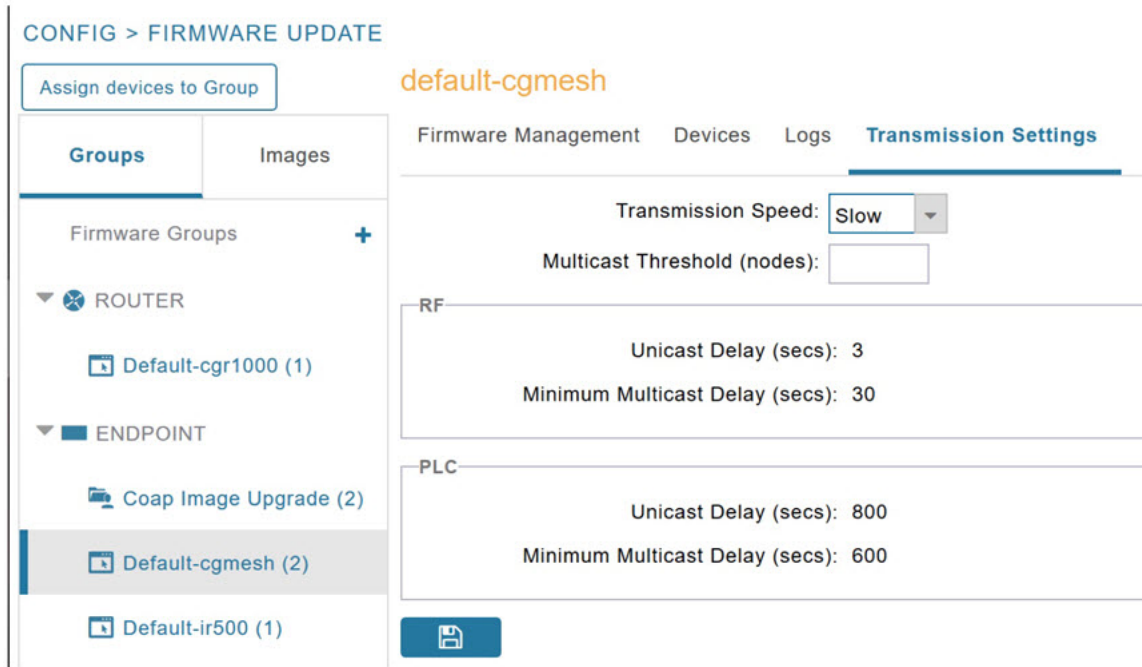


Table 2: Definitions of variables seen on CONFIG > FIRMWARE UPDATE Transmissions Settings page

Item	Description
Minimum Multicast Delay (seconds)	Time between subsequent blocks when sending multi-cast messages/blocks/packets to a node.
Multicast Threshold (nodes)	Minimum number of nodes needed to ensure that a multicast transmission can happen in a subnet, if the number of elements requiring a specific image block is greater than or equal to the multicast-threshold value.
Transmission Speed	Options are Slow (default), Medium, Fast or Custom.
Unicast Delay (seconds)	Time between subsequent blocks when sending unicast messages, blocks or packets to a node.

Uploading a Firmware Image to a Resilient Mesh Endpoint (RME) Group

To upload a firmware image to mesh endpoint group members:

- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
- Step 2** Click the **Groups** tab (left-pane).
- Step 3** Select the Endpoint firmware group to update.
- Step 4** In the right panel, select Firmware Management and then click the Upload Image button. In the entry panel that appears, do the following:

- a) From the Select Type drop-down menu, choose the firmware type for your device.
- b) From the Select an Image drop-down menu, choose the firmware bundle to upload.
- c) Click **Upload Image**.
- d) (Optional) Check the Install patch box, if you choose to *install only the patch* of the new image (For more information, see [Figure 3: Check Install Patch Item to ONLY Install the Patch Rather than the Full Image](#), on page 9).

Figure 3: Check Install Patch Item to ONLY Install the Patch Rather than the Full Image

- e) Click **OK**.

IoT FND adds the image to the list of images in the Firmware Management pane and starts the upload process in the background. A bar chart displays the upload progress (percentage complete). See [Figure 4: Firmware Update - Percentage Complete \(top-portion of screen\)](#), on page 9 and [Figure 5: Firmware Update - Upload Summary \(bottom-portion of screen\)](#), on page 10.

Note Click the Sync Membership button to ensure that FND and the member endpoint firmware group information are the same.

Figure 4: Firmware Update - Percentage Complete (top-portion of screen)

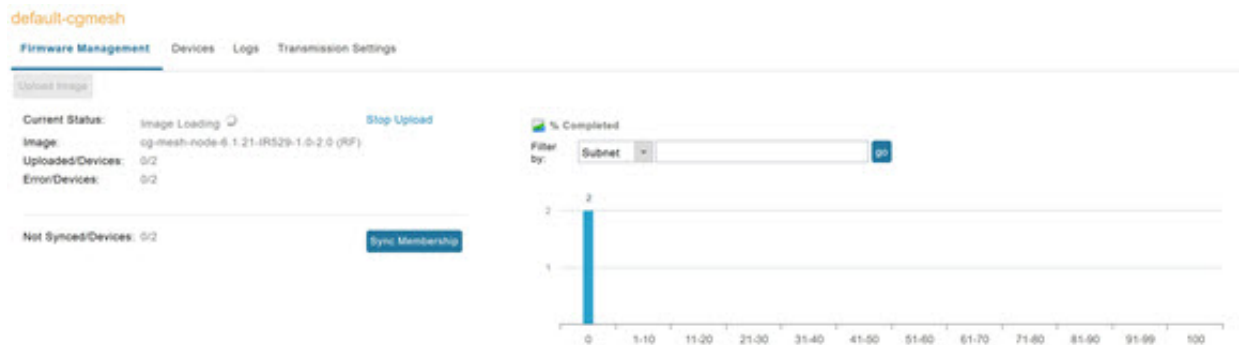


Figure 5: Firmware Update - Upload Summary (bottom-portion of screen)

Image	Uploaded	Running	Backup	Boot Loader	LMAC	BBU	Status	Scheduled Reload	Actions
cg-mesh-iron30-sl-REL-5.2.25	0	0	0	2	0	0			
cg-mesh-node-5.7.27-RFLAN-3.60-3.80	0	0	1	0	0	0			
cg-mesh-node-6.1.27-RFLAN-3.60-3.80	2	2	0	0	0	0			

ALL(3) | BU(1) | RF(2)

Clear Filter

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Pan Id	Subnet Prefix	Nodes in Group (Total in Subnet)	Upload Status	Last Message sent
557	2002-dead b...	2 (13)	0 / 2	[2019-06-27 16:20:25] Status: Attempt 1 Sent transfer request for cg-mesh-node-6.1.27-IR529-1.0-2.0 to 2002-dead beef cafe:9dca:3fcc:1441:abec. Will wait 10 secs (unicast-delay=1 secs)

Uploading a Firmware Image to FND

To upload a firmware image to mesh endpoint group members:

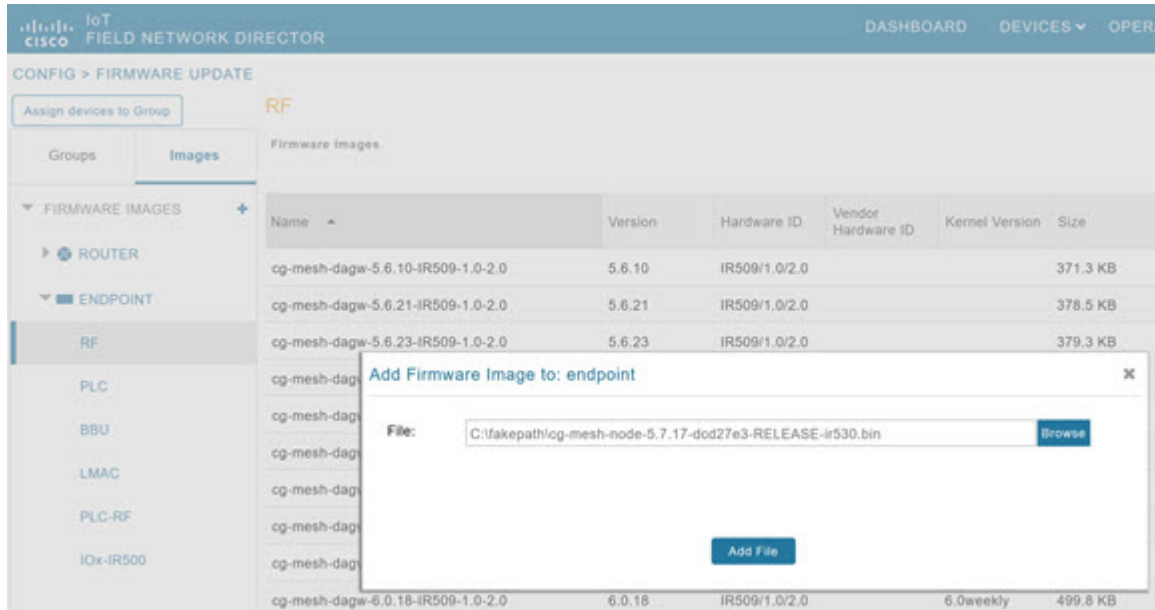
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
- Step 2** Select the **Images** tab (left-pane).
- Step 3** Select the Endpoint Image type (such as BBU, IOx-IR500 LMAC) to be uploaded.
- Step 4** Click on + (plus icon) next to the FIRMWARE IMAGES heading to browse the firmware from your local system.
- Step 5** Browse and click on **Add file**.

IoT FND can upload the following image types to ENDPOINT devices as shown in the table below:

Table 3: Firmware Images for Endpoints

Image Type	Description
RF	For endpoints with RF radio only.
PLC	For endpoints with Power line communication (PLC) radio only.
BBU	For Battery back up (BBU) units.
LMAC	For Local MAC connected devices.
IOx-IR500	For IR500 devices running Cisco IOx software.

Figure 6: Using IoT FND to Upload Images to an Endpoint



Modifying Display of Firmware Management Page

You can filter the Firmware Management page display by Subnet, PanId or Group in the Devices tab.

To modify the display of firmware management page:

Step 1 Choose **CONFIG > FIRMWARE UPDATE**.

Step 2 Click the **Sync Membership** button to ensure that the information for FND and the member endpoint firmware group is the same.

Figure 7: CONFIG > FIRMWARE UPDATE

The screenshot displays the 'CONFIG > FIRMWARE UPDATE' interface. On the left, a sidebar shows a list of firmware groups under 'Firmware Groups': ROUTER (Default-cgr1000 (1)), ENDPOINT (Coap Image Upgrade (2), Default-cgmesh (2), Default-ir500 (1)). The 'default-cgmesh' group is selected. The main area shows the 'Transmission Settings' for this group, with tabs for 'Firmware Management', 'Devices', 'Logs', and 'Transmission Settings'. The settings include: Transmission Speed (Slow), Multicast Threshold (nodes) (empty field), RF Unicast Delay (secs): 3, RF Minimum Multicast Delay (secs): 30, PLC Unicast Delay (secs): 800, and PLC Minimum Multicast Delay (secs): 600. A save button is visible at the bottom.

Viewing Mesh Device Firmware Image Upload Logs

To view the mesh device firmware image upload logs:

Step 1 Click the **Sync Membership** button to sync the group members in the same firmware group.

Step 2 Click the **Devices** tab to view member's devices.

Step 3 Click the **Logs** tab to view log files for the group.

For more information, refer to [Figure 4: Firmware Update - Percentage Complete \(top-portion of screen\), on page 9](#).

AP800 Firmware Upgrade During Zero Touch Deployment

During the PnP bootstrapping, whenever an access point (AP) or router sends the firmware request, FND will need to make the choice as to whether Unified Firmware or Autonomous Firmware is updated on the AP to make it accessible to the Cisco Wireless LAN Controller (WLC) after a firmware upgrade.



Note Once you set up the DHCP server on a Cisco IOS router, WLC generally handles the software updates for the AP.

Allows you to set the desired firmware that will update an IR829 router during ZTD.

There are two possible firmware options:

- **Option 1:** Set the ‘unified’ version (k9w8: the factory-shipped version) as the desired firmware.
- **Option 2 :** Set the autonomous firmware as the desired firmware version.

During the ZTD process, the firmware upgrade of an access point (AP) or embedded AP on an IR829 router will upgrade using the firmware version you define as the autonomous firmware.

To define the Autonomous Firmware for an IR829 router:

-
- Step 1** Choose **CONFIG > DEVICE CONFIGURATION**.
- Step 2** Select the desired router: Default-ir800 (left-pane).
- Step 3** Check the installed firmware version, BEFORE upload. if equal to the latest version, skip firmware upgrade.
- Step 4** Before you upload the software to the router, check the image and version:
- If the router image version is equal to the latest version, skip upgrade.
 - If router image has the latest
- Step 5** Select Edit AP Configuration Template tab (right-pane).
- Step 6** Enter the following text in the right-pane:
- ```
ip dhcp pool embedded-ap-pool
network <router_ip> 255.255.255.0
dns-server <dns_ip>
default-router <router_ip>
option 43 hex f104.0a0a.0a0f (Note: Enter a single WLC IP
address(10.10.10.15) in hex format)
ip address <router_ip> 255.255.255.0
! {Note the symbol in this line is an exclamation point}
service-module wlan-ap 0 bootimage unified
```
- Step 7** Click disk icon (bottom of page) to save the commands in the configuration template.
- 

## Image Diff Files for IR809 and IR829

To reduce the file size that transfers across network for IR809 and IR829, you can send a partial image:

- At the Upload Image page, select type: IOS-IR800.
- Check box for option: “install patch for IOS and hypervisor from this bundle.”

## Gateway Firmware Updates

IC3000 Firmware Updates:

- At the **CONFIG > FIRMWARE UPDATE** page, you can add or delete the IC3000 firmware image.



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**Note** Firmware image upload depends on interface speeds. You can set the timeout duration (in minutes) for firmware upload in `cgms.properties` file using "igma-idle-timeout" key. If you don't set this duration, then default timeout duration will be 15 minutes.

---

- At the **Images** tab page, expand the Gateway icon and click on IC3000 to see a list of available IC3000 images.

## Configuring Firmware Group Settings

This section describes how to add, delete, and configure firmware groups, and includes the following topics:

- [Adding Firmware Groups, on page 15](#)
- [Assigning Devices to a Firmware Group, on page 16](#)
- [Renaming a Firmware Group, on page 18](#)
- [Deleting Firmware Groups, on page 18](#)



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**Note** Upload operations only begin when you click the **Resume** button.

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When you add routers or RMEs to IoT FND, the application sorts the devices into the corresponding default firmware group: `default-<router>` or `default-cgmesh`. Use these groups to upload and install firmware images on member devices. Add firmware groups to manage custom sets of devices. You can assign devices to firmware groups manually or in bulk. Before deleting a firmware group, you must move all devices in the group to another group. You cannot delete non-empty groups.

When creating firmware groups note the guidelines:

- CGRs, IR800s can coexist on a network; however, for firmware management, they cannot belong to the same firmware group.
- IR500s and other RMEs devices can coexist on a network; however, for firmware management, they cannot belong to the same group.

The Groups tab on the **CONFIG > FIRMWARE UPDATE** page displays various device metrics.

Figure 8: CONFIG > FIRMWARE UPDATE

| Name                                              | Version | Hardware ID         | Vendor Hardware ID      | Kernel Version | Size     | Active Download? |
|---------------------------------------------------|---------|---------------------|-------------------------|----------------|----------|------------------|
| Vendor Firmware Name-6.4.9-CGREF3_E-1.0-1.0       | 6.4.9   | CGREF3_E/1.0/1.0    |                         |                | 335.3 KB | No               |
| Vendor Firmware Name-6.4.12-THIRD_PARTY-9.0-1.0   | 6.4.12  | THIRD_PARTY/9.0/1.0 | 00173B/CGEFER BOARD/0.0 |                | 59.5 KB  | No               |
| Vendor Firmware Name-6.4.11-THIRD_PARTY-1.0-1.0   | 6.4.11  | THIRD_PARTY/1.0/1.0 |                         |                | 333.0 KB | No               |
| thirdparty_fw_name-10.0.6-THIRD_PARTY-1.0-1.0     | 10.0.6  | THIRD_PARTY/1.0/1.0 |                         |                | 730 B    | No               |
| THIRD_PARTY_15.0.2 bin-15.0.2-THIRD_PARTY-1.0-1.0 | 15.0.2  | THIRD_PARTY/1.0/1.0 |                         |                | 276.5 KB | No               |
| THIRD_PARTY_15.0.1 bin-15.0.1-THIRD_PARTY-1.0-1.0 | 15.0.1  | THIRD_PARTY/1.0/1.0 |                         |                | 276.5 KB | No               |
| cp-mesh-node-6.4.9-CGREF3-1.0-1.0                 | 6.4.9   | CGREF3/1.0/1.0      |                         | 6.4weekly      | 348.0 KB | No               |
| cp-mesh-node-5.7.27-IR529-1.0-2.0                 | 5.7.27  | IR529/1.0/2.0       |                         |                | 410.8 KB | No               |
| cp-mesh-node-5.7.27-IR529-1.0-2.0                 | 5.7.27  | IR529/1.0/2.0       |                         |                | 410.8 KB | No               |
| cp-mesh-node-5.7.25-IR529-1.0-2.0                 | 5.7.25  | IR529/1.0/2.0       |                         |                | 410.8 KB | No               |
| cp-mesh-node-5.7.24-IR529-1.0-2.0                 | 5.7.24  | IR529/1.0/2.0       |                         |                | 410.5 KB | No               |
| cp-mesh-node-5.6.19-IR529-1.0-2.0                 | 5.6.19  | IR529/1.0/2.0       |                         |                | 355.3 KB | No               |
| cp-mesh-dagw-6.3.14-IR510-1.0-2.0                 | 6.3.14  | IR510/1.0/2.0       |                         | 6.3weekly      | 595.8 KB | No               |
| cp-mesh-dagw-6.2.19-IR510-1.0-2.0                 | 6.2.19  | IR510/1.0/2.0       |                         | 6.2            | 519.0 KB | No               |
| cp-mesh-dagw-6.2.18-IR510-1.0-2.0                 | 6.2.18  | IR510/1.0/2.0       |                         | 6.2            | 518.8 KB | No               |
| cp-mesh-dagw-6.2.17-IR510-1.0-2.0                 | 6.2.17  | IR510/1.0/2.0       |                         | 6.2weekly      | 518.3 KB | No               |
| cp-mesh-dagw-6.1.29-IR510-1.0-2.0                 | 6.1.29  | IR510/1.0/2.0       |                         | 6.1weekly      | 676.0 KB | No               |
| cp-mesh-dagw-6.0.3-IR509-1.0-2.0                  | 6.0.3   | IR509/1.0/2.0       |                         |                | 479.8 KB | No               |

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**Tip** At the Firmware Update page, click the Error/Devices link (not shown) in [Figure 9: Firmware Upgrade Page – Viewing Errored Devices](#), on page 15 to apply a filter.

Click **Clear Filter** to revert to an unfiltered view of the selected device group.

Figure 9: Firmware Upgrade Page – Viewing Errored Devices

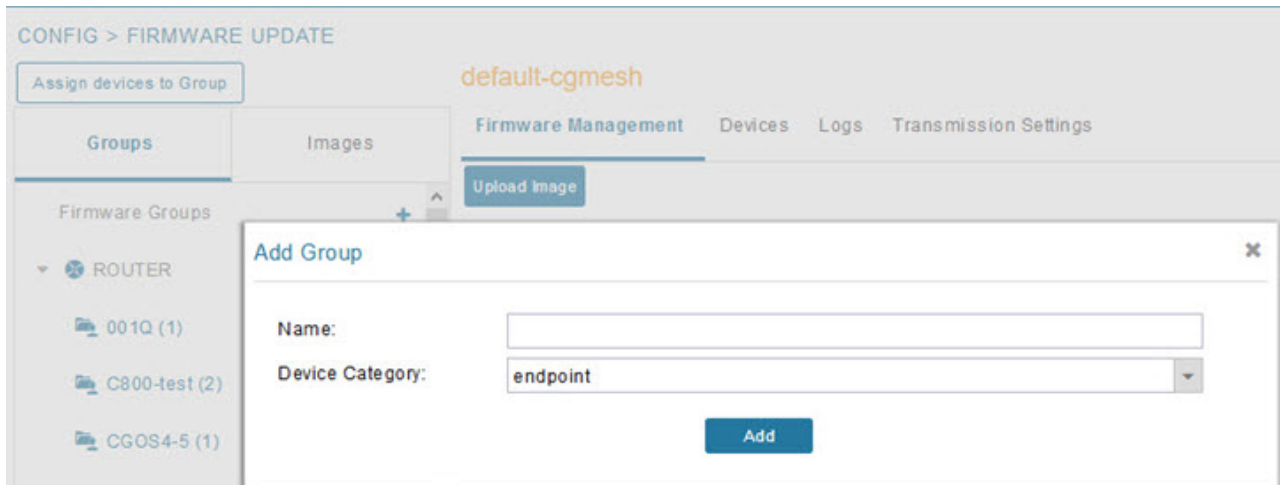
| IP Address    | Firmware Version | Activity | Update Progress | Last Firmware Status Heard | Error Message | Error Details |
|---------------|------------------|----------|-----------------|----------------------------|---------------|---------------|
| 172.27.88.248 | 5.2(1)CG4(3)     | Unknown  | 0%              | 2017-01-22 16:35           |               |               |

## Adding Firmware Groups

To add a firmware group:

**Step 1** Choose **CONFIG > FIRMWARE UPDATE**.

**Step 2** Click the **Groups** tab.



**Step 3** In the Groups pane, select one of the following:

- Default-cgr1000
- Default-ir500
- Default-ir800
- Default-cgmesh

**Step 4** Click + next to Firmware Groups heading in the Groups pane to Add Group.

**Step 5** In the **Add Group** dialog box, enter the name of the firmware group. Device Category options depend on the device type you select in [Step 3](#).

**Step 6** Click **Add**.

The new group label appears under the corresponding device type in the Firmware Groups pane.

**Note** To assign devices to the new group, see [Assigning Devices to a Firmware Group, on page 16](#).

## Assigning Devices to a Firmware Group

This section explains moving devices to another firmware group in bulk or manually.

### Moving Devices to Another Group In Bulk

To move devices from one group to another in bulk:

**Step 1** Create a CSV or XML file listing devices that you want to move using the format shown in the following examples:



|                                                                                                                                |                                                                                    |                                                     |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>DeviceType/EID for CGRs:</b><br>eid<br>CGR1120/k9+JS1<br>CGR1120/k9+JS2<br>CGR1120/k9+JS3                                   | <b>EID only for mesh endpoints:</b><br>eid<br>00078108003c1e07<br>00078108003C210b | <b>EID only for IR800s</b><br>eid<br>ir800          |
| <b>EID only for ISR 800s:</b><br>eid<br>C819HGW-S-A-K9+FTX174685V0<br>C819HGW-S-A-K9+FTX174686V0<br>C819HGW-S-A-K9+FTX174687V0 | <b>EID only for IR500s:</b><br>eid<br>da1<br>da2<br>da3                            | <b>EID only for IC3000</b><br>eidIC3000+FOC2219Y47Z |

**Note** Each file can only list one device type.

**Step 2** Choose **CONFIG > FIRMWARE UPDATE**.

**Step 3** Click the **Groups** tab.

**Step 4** Click the **Assign devices to Firmware Group** button (found above the Groups tab).

**Step 5** In the window that appears, click **Browse** and locate the device list CSV or XML file.

**Step 6** From the **Group** drop-down menu, choose the destination group.

**Step 7** Click **Assign to Group**.

**Note** IoT FND moves the devices listed in the file from their current group to the destination group.

**Step 8** Click **Close**.

## Moving Devices to Another Group Manually

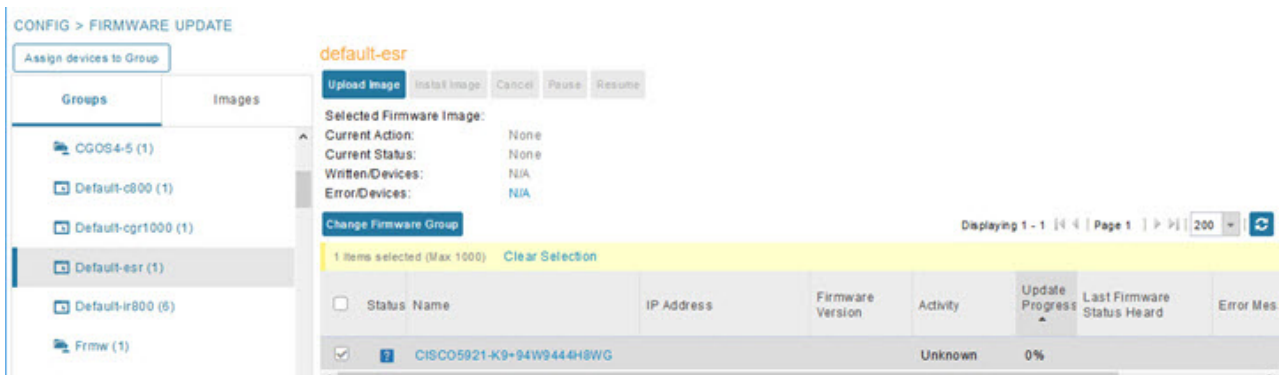
To manually move devices to a group:

**Step 1** Choose **CONFIG > FIRMWARE UPDATE**.

**Step 2** Click the **Groups** tab.

**Step 3** In the Firmware Groups pane, select the desired firmware group based on device type.

**Note** If this is an ENDPOINT firmware group, click the **Devices** tab above the main pane.



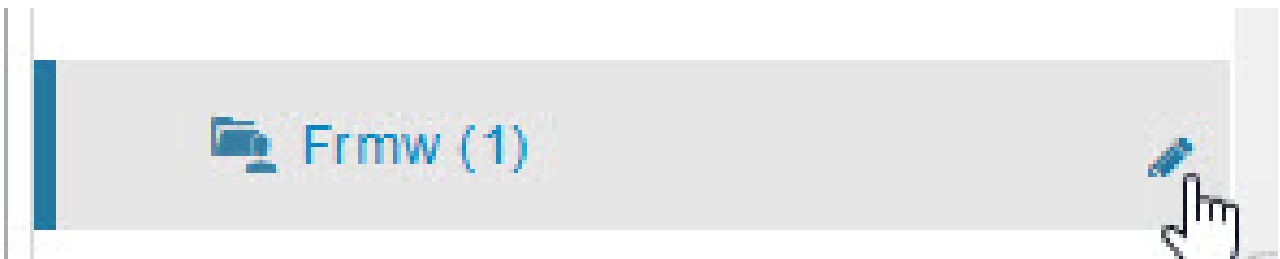
- Step 4** Check the check boxes of the devices that you want to move.
- Step 5** Click **Change Firmware Group** to open a pop up window.
- Step 6** From the **Firmware Group** drop-down menu, choose the firmware group to which you want to move the devices or enter a new group name.
- Step 7** Click **Change Firmware Group**.
- Step 8** Click **Close**.

## Renaming a Firmware Group

In the **Firmware Update** page, there are two firmware groups available, namely user-created groups and default groups of router, endpoint, or gateway. IoT FND allows you to rename the user-created firmware groups only. You cannot rename the default firmware groups.

To rename a firmware group:

- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
- Step 2** Click the **Groups** tab.
- Step 3** In the Firmware Groups pane, select the firmware group to rename.
- Step 4** Move the cursor over the firmware group and click the **Edit Group Name** pencil icon.



**Note** Starting with IoT FND, you can only rename the user-created firmware groups and you cannot rename the default firmware groups. The pencil icon does not appear for the default firmware groups.

- Step 5** In the **Rename Group** window, enter the new name and then click **OK**.

**Note** When you enter an invalid character entry (such as, @, #, !, or +) within the Rename Group field, IoT FND displays a red alert icon, highlights the field in red, and disables the **OK** button.

## Deleting Firmware Groups



**Note** Before deleting a firmware group, you must move all devices in the group to another group. You cannot delete non-empty groups.

To delete a firmware group:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
- Step 2** Click the **Groups** tab.
- Step 3** In the Firmware Groups pane, select a firmware group to display a list of all possible firmware images for that group in the right pane.
- Step 4** Check the box next to the firmware group that you want to delete.
- Step 5** Click Clear Selection that appears above the entry (yellow bar).
- Step 6** To confirm deletion, click **Yes**.
- Step 7** Click **OK**.
- 

## Working with Router Firmware Images

This section describes how to work with router firmware images in IoT FND.

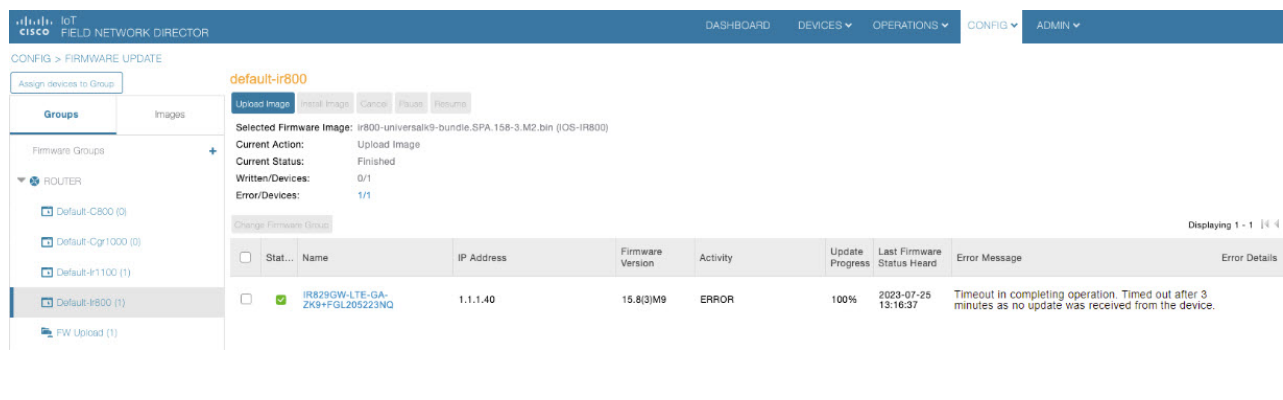
### Installing a Firmware Image

To install an image on devices in a router firmware group:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
- Step 2** Click the **Groups** tab.
- Step 3** In the Groups pane, select the firmware group.
- Note** IoT FND recognizes devices as firmware-specific, and uploads the proper image to selected devices.
- Step 4** In the Images pane, select a device subgroup (such as IOS-CGR, IOS-WPAN-RF, CDMA) to refine the display to those device types.
- This step above is necessary because IoT FND recognizes devices as firmware-specific and ensures the system uploads the proper image to selected devices.
- Step 5** At the **CONFIG > FIRMWARE UPDATE** page, click the Groups tab; and, then **Install Image** on the Firmware Upgrade tab.
- IoT FND sends commands to install the uploaded image and make it operational.
- Step 6** Click **Yes**.
- IoT FND starts the installation or reloading process.
- Note** If you restart IoT FND during the image installation process, IoT FND restarts the firmware installation operations that were running prior to IoT FND going offline.
- You can pause or stop the installation operation as described in:
- [Stopping Firmware Image Installation, on page 24](#)
  - [Pausing and Resuming Router Firmware Image Installation, on page 23](#)

**Note** The firmware installation operation can time out on some routers. During firmware install, the job scheduler that runs every two hours times out the stuck firmware install jobs that has progressed upto 35%. The default time of the job scheduler of two hours can be modified in the "firmware-install-timeout-schedule-cron-hour" key in the cgms.properties file. Provide values within the range of greater than 0 and less than 24. This job scheduler is applicable only for install at 35%.

**Note** When a firmware install or image upload operation for routers take extended run time, it can result in prolonged wait times for the other jobs in the queue. You can configure timeout duration for the stuck firmware jobs in the "router-firmware-upload-timeout-minutes" and "router-firmware-install-timeout-minutes" keys in cgms.properties file. The default value is set to 8 hours (480 minutes). The timeout is accounted after the device stops responding and the following error message is displayed.



The screenshot shows the Cisco IoT Field Network Director interface. The main heading is 'default-ir800'. Below it, there are buttons for 'Upload Image', 'Install Image', 'Cancel', 'Pause', and 'Resume'. The 'Selected Firmware Image' is 'ir800-universalk9-bundle.SPA.158-3.M2.bin (IOS-IR800)'. The 'Current Action' is 'Upload Image' and the 'Current Status' is 'Finished'. The 'Written/Devices' is '0/1' and the 'Error/Devices' is '1/1'. Below this, there is a table with columns: Stat..., Name, IP Address, Firmware Version, Activity, Update Progress, Last Firmware Status Heard, Error Message, and Error Details. The table shows one entry with a green checkmark in the 'Stat...' column, a name 'IR829GW-LTE-GA-ZK9+FGI20523NQ', IP Address '1.1.1.140', Firmware Version '15.8(3)M9', Activity 'ERROR', Update Progress '100%', Last Firmware Status Heard '2020-07-25 13:16:37', and Error Message 'Timeout in completing operation. Timed out after 3 minutes as no update was received from the device.' The 'Error Details' column is empty.

## Adding a Firmware Image to IoT FND

Before you can upload and install a firmware image on a device, add the image file (as a zip archive) to IoT FND. IoT FND stores the image in its database.



**Note** Do not unzip the image file. IoT FND unzips the file.

To add a firmware image to IoT FND:

- Step 1** Choose **CONFIG** > **FIRMWARE UPDATE**.
- Step 2** Click the **Images** tab ( [CONFIG](#) > [FIRMWARE UPDATE](#) > [Image](#)).
- Step 3** In the Images pane, select **ROUTER**, **ENDPOINT**, or **GATEWAY** and the type of device group.
- Step 4** Click the + icon to select an image found to the right of the Firmware Images heading.
- Step 5** Click **Browse** to locate the firmware image. Select the image, then click **Add File**.
- Step 6** Click **Upload**.

The image appears in the Firmware Images panel ( [CONFIG](#) > [FIRMWARE UPDATE](#) > [Image](#)).

- To delete an image, click the **Delete link** shown at far-right of entry. Click **Yes** to confirm.

Firmware images with a download in progress (with Yes in the Active Download? column) cannot be deleted.

- To upload the firmware image to devices in a group, select the group (from Groups listing on CONFIG > FIRMWARE UPDATE page) and then click **Upload Image**. See [Uploading a Firmware Image to a Router Group, on page 21](#).

## Uploading a Firmware Image to a Router Group

When you upload a firmware image to router firmware group members, IoT FND pushes the image to the group members in the background and tracks the upload progress to ensure that the devices receive the image.

On routers, firmware image upload and installation requires 200 MB of free disk space. IoT FND stores image files in the `.../managed/images` directory on the router.



**Note** If there is not enough disk space on the router for the firmware image, the IoT FND initiates disk cleanup process on the router and removes unused files in the `.../managed/images` directory that is not currently running or referenced in the `before-tunnel-config`, `before-registration-config`, `express-setup-config`, and `factory-config` files for IOS CGRs, sequentially, until there is enough disk space to upload the new image.

If there is still not enough space, you must manually delete unused files on the router.

To upload a firmware image to router group members:

**Step 1** Choose **CONFIG > FIRMWARE UPDATE**.

Figure 10: Updating Firmware for a CGR1000

The screenshot shows the Cisco IoT Field Network Director interface. The top navigation bar includes 'IoT FIELD NETWORK DIRECTOR', 'DASHBOARD', 'DEVICES', 'OPERATIONS', and 'CONFIG'. The main content area is titled 'CONFIG > FIRMWARE UPDATE' and shows the 'default-cgr1000' group. On the left, there is a 'Groups' tab with a list of groups: 'Firmware Groups', 'ROUTER', 'Default-c800 (1)', 'Default-cgr1000 (3)', 'Default-esr5900 (1)', 'Default-ir1100 (0)', 'Default-ir800 (2)', and 'Default-sbr (1)'. The 'Default-cgr1000 (3)' group is selected. The main content area shows the 'Upload Image' button and a table of devices:

| Selected Firmware Image: | Current Action: | Current Status: | Written/Devices: | Error/Devices: |
|--------------------------|-----------------|-----------------|------------------|----------------|
| C1000-B-K9+FTX180001QX   | None            | None            | N/A              | N/A            |
| CGR1240/K9+FTX2150G01P   |                 |                 |                  |                |
| CGR1120/K9+JAF1702BCDE   |                 |                 |                  |                |

Below the table, there is a 'Change Firmware Group' section with a table of devices:

| IP Address | Firmware Version | Activity |
|------------|------------------|----------|
| 2.2.55.220 | 15.7(3)M2        | Unknown  |

521616

**Step 2** Click the **Groups** tab.

**Step 3** In the Groups pane, select the router firmware group that you want to update.

IoT FND displays the firmware image type applicable to the router:

| Image          | Type          | Applicable Devices                                                               |
|----------------|---------------|----------------------------------------------------------------------------------|
| CDMA           | All           | Cisco IOS CGRs, IR800s, and ISR800s.                                             |
| GSM            | All           | Cisco IOS CGRs, IR800s, and ISR800s.                                             |
| IOS-CGR        | CGR1000       | Cisco IOS CGRs (CGR1240 and CGR1120) .                                           |
| IOS-AP800      | AP800         | Cisco 800 Series Access Points.                                                  |
| IOS-IR800      | IR800         | Cisco 800 Series ISRs.                                                           |
| LORAWAN        | lorawan       | Cisco IR829-GW                                                                   |
| IOS-WPAN-RF    | CGR1000       | Cisco IOS-CGR                                                                    |
| IOS-WPAN-PLC   | CGR1000       | Cisco IOS-CGR                                                                    |
| IOS-WPAN-OFDM  | CGR1000       | Cisco IOS-CGR                                                                    |
| IOS-WPAN-IXM   | IR800         | LoRaWAN IXM module when operating as an interface for Cisco IR809.               |
| IOx-CGR        | cgr1000-ioxvm | Cisco IOS-CGR                                                                    |
| IOx-IR800      | IR800         | Cisco 800 Series ISRs.                                                           |
| IOS-IR807      | IR800         | Image (Cisco IOS only) loads to IR807 within the IR800 firmware group.           |
| IOS-XE-IR1100  | IR1100        | Cisco 1101 Series Industrial Integrated Services Routers                         |
| IOS-XE-IR1800  | IR1800        | Cisco Catalyst IR1800 Rugged Series Routers (IR1821, IR1831, IR1833, and IR1835) |
| IOS-XE-IR8100  | IR8100        | Cisco IR8140 Heavy-Duty Series Routers                                           |
| IOT-FND-IC3000 | IC3000        | Cisco IC3000 Gateway                                                             |

**Step 4** Click **Upload Image** to open the entry panel.

**Step 5** From the **Select Type:** drop-down menu, choose the firmware type for your device.

**Step 6** From the **Select an Image:** drop-down menu, choose the firmware bundle to upload.

For some software bundles, you also have the option to select one or more of the following options (as noted in parenthesis next to the options listed below):

- Install Guest OS from this bundle (IOS-CGR, IOS-IR800).
- Clean LoRaWAN application data on the install (LORAWAN).
- Install WPAN firmware from this bundle (IOS-CGR).

**Step 7** Click **Upload Image**.

**Step 8** Click **OK**.

IoT FND starts the upload process. After the image uploads, install the image as described in [Installing a Firmware Image](#), on page 19.

---

## Pausing and Resuming Router Firmware Image Installation

You can pause the firmware image installation process at any time.



---

**Note** Pausing the installation pauses all queued tasks. Currently running tasks complete.

---

To pause firmware image installation to devices in a firmware group:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
  - Step 2** In the Groups pane, select the firmware group.
  - Step 3** In the Firmware Upgrade window, click the **Pause** button.
  - Step 4** Click **Yes** to confirm the action.
- You can resume the installation process by clicking **Resume**.
- 

## Pausing and Resuming Router Firmware Image Uploads

You can pause the image upload process to router firmware groups at any time, and resume it later.



---

**Note** The image upload process does not immediately pause; all queued (but not running) operations pause, but currently running tasks complete. The status changes to PAUSING until the active operations complete.

---

To pause firmware image upload:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
  - Step 2** Click the **Groups** tab.
  - Step 3** In the Groups pane, select the firmware group.
  - Step 4** Click **Pause**.
- The Status column displays PAUSING until the active upload operations complete. No new upload operations start until you click the **Resume** button.
- Step 5** Click **Yes**.
- To resume the upload process, click **Resume**.
-

**Note** If a IoT FND server goes down while the firmware image is being uploaded to devices, the server resumes the upload process for the scheduled devices after the server comes up. For IoT FND server clusters, if one server goes down during the upload process, another server in the cluster resumes the process.

---

## Stopping Firmware Image Installation

You can stop firmware image installation at any time. When you stop image installation, the running version of the firmware remains in place.



---

**Note** Stopping the installation cancels all queued tasks. Currently running tasks complete.

---

To stop firmware image installation to devices in a firmware group:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
  - Step 2** Click **Groups**.
  - Step 3** In the Groups pane, select the firmware group.
  - Step 4** In the Firmware Upgrade window, click **Cancel** button.
  - Step 5** Click **Yes** to confirm the action.
- 

## Canceling Router Firmware Image Upload

You can stop the image upload process to firmware router groups at any time. Stopping the upload can take a few minutes. When you cancel the image upload, the image upload process immediately stops currently running tasks, and blocks all queued tasks.



---

**Note** Running tasks do not complete, leaving partial files on the disk and sets the firmware group status to CANCELING until you complete the upload operation.

---

To stop firmware image uploading to a group:

- 
- Step 1** Choose **CONFIG > FIRMWARE UPDATE**.
  - Step 2** Click the **Groups** tab.
  - Step 3** In the Groups pane, select the firmware group.
  - Step 4** Click **Cancel**.
  - Step 5** Click **Yes**.
-

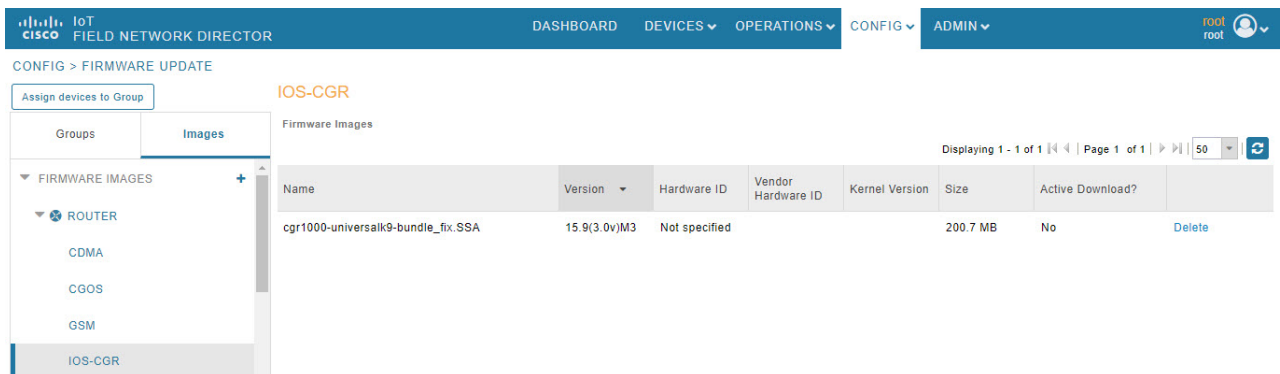


## Viewing Firmware Image Files in IoT FND

To view the firmware image files in IoT FND:

- Step 1** Go to **Images** pane in the **CONFIG > FIRMWARE UPDATE** page.
- Step 2** Select **ROUTER** or **ENDPOINT** to display all firmware images for those devices in the IoT FND database.
- Step 3** Select the firmware image type to refine the display (see [CONFIG > FIRMWARE UPDATE > Image](#)).

Figure 11: CONFIG > FIRMWARE UPDATE > Image



## Support for Wi-SUN Stack Switch

Starting with Cisco IoT FND 4.8.1 release, you can switch devices from CG-Mesh to Wi-SUN (Wireless and Smart Utility Networks) stack. User with administrative privilege or firmware upgrade permission can only perform this switch operation. During the switching process, a single or multiple PAN nodes are grouped and scheduled for switching devices from CG-Mesh to Wi-SUN stack. Wi-SUN stack supports both unicast and multicast transmissions. For more information on the switching process, refer to [Switching Devices from CG-Mesh to Wi-SUN Stack, on page 26](#).

### Supported Platforms

IoT FND supports the following platforms for switching devices from CG-Mesh to Wi-SUN stack:

- ITRON30
- IR510
- IR530

### Prerequisites

- Firmware version must be 6.2 MR.
- CGR version must be greater than Cisco IOS 15.9(3)M1.



**Note** On successful switching of devices from CG-Mesh to Wi-SUN stack mode, ensure to update the WPAN OFDM/FSK stack mode to Wi-SUN stack. If the WPAN OFDM/FSK is not updated, the node cannot join back the network and will move to *Down* state in FND.

**Table 4: Feature History**

| Feature Name                    | Release Information | Description                                                             |
|---------------------------------|---------------------|-------------------------------------------------------------------------|
| Support For Wi-SUN Stack Switch | IoT FND 4.8.1       | This feature allows you to switch devices from CG-Mesh to Wi-SUN stack. |

## Switching Devices from CG-Mesh to Wi-SUN Stack

The process of switching devices from CG-Mesh to Wi-SUN stack involves the following tasks:

1. [Pushing Devices to Wi-SUN Stack Mode, on page 26](#)
2. [Scheduling Devices for Wi-SUN Stack Switch](#)

| <a href="#">Clear Filter</a> <a href="#">Push StackMode</a> <a href="#">Push StackMode Time</a> <a href="#">Cancel StackMode</a> <span>Displaying 1 - 2 of 2</span> <span>Page 1 of 1</span> <span>200</span> |        |                 |                                  |               |                        |                                       |                                                                                                                           |                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------|----------------------------------|---------------|------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------------|
| <input type="checkbox"/>                                                                                                                                                                                      | Pan Id | Subnet Prefix   | Nodes in Group (Total in Subnet) | Upload Status | Stack Operation Status | Stack Operation Type                  | Last Message sent                                                                                                         | Scheduled Stack Change |
| <input type="checkbox"/>                                                                                                                                                                                      | 133    | 2011:abcd:11... | 6 (5)                            | / 6           | / 6                    | No Operation                          | [2022-04-14 03:56:06] User selected subnet 2011:abcd:1111:2222:0:0:0:0 to be excluded from cancel install image operation |                        |
| <input type="checkbox"/>                                                                                                                                                                                      | 12     | 2010:abcd:11... | 2 (3)                            | 2 / 2         | 2 / 2                  | Stack Mode Cancel Operation Completed | [2022-04-14 04:01:38] Finishing subnet 2010:abcd:1111:3333:0:0:0:0 after CANCELLED_STACKMODE_SWITCH                       |                        |



**Note** If the selected PAN ID spans across multiple groups, then all the devices in that PAN get pushed with new stack mode and time or get cancelled.

## Pushing Devices to Wi-SUN Stack Mode

To push devices to Wi-SUN stack mode:

- Step 1** Choose **CONFIG > Firmware Update**.
- Step 2** Click the **Groups** tab in the left pane.
- Step 3** Select the default or user-defined firmware group from the **ENDPOINT**.
- Step 4** Check the **PAN ID** check box in the **Stack Mode Switch** table for which you want to push the stack mode.
- Step 5** Click **Push StackMode**.

Based on the status of the push stack mode process, the following states are displayed for the selected PAN ID in the **Stack Mode Switch** table.

**Table 5: PAN ID Status**

| Field                         | Description                                                                                                                                                                                                                                                                                                   |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stack Operation Type Column   | Displays the following states for the push stack mode operation: <ul style="list-style-type: none"> <li>• <b>Stack Mode Push Initiated</b> — Denotes the initiation of the stack mode operation.</li> <li>• <b>Stack Mode Push Completed</b> — Denotes the completion of the stack mode operation.</li> </ul> |
| Stack Operation Status Column | Displays the overall success and failure status of the devices for the selected PAN during the stack mode operation.                                                                                                                                                                                          |

**Note** The **Devices** tab displays the status of the stack mode operation at the device level. For more information, refer to [Viewing Stack Mode Information for Devices, on page 31](#)

- a) In the **Stack Mode Push Initiated** state, the devices in the selected PAN ID are validated based on the following scenarios:

**Table 6: Push Stack Mode Validation**

| Scenarios                | System Validation                                                                                                                                                                                                                                                                                                                         | User Action                                                                                                                                                                                                      |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Firmware version 6.2 MR. | Checks if the devices in the selected PAN ID are running firmware version 6.2 MR. <ul style="list-style-type: none"> <li>• If the firmware version is lower than 6.2 MR, then an error message appears.</li> </ul> <p><b>Note</b> Go to the <b>Devices</b> tab, for more information on the devices that are running a lower version.</p> | <ul style="list-style-type: none"> <li>• You must upgrade the devices to firmware version 6.2 MR.</li> <li>• After upgrading the devices, you must again push new stack mode for the selected PAN ID.</li> </ul> |
|                          | <ul style="list-style-type: none"> <li>• If the firmware version is greater than 6.2 MR, then the devices are already in Wi-SUN stack.</li> </ul>                                                                                                                                                                                         |                                                                                                                                                                                                                  |

| Scenarios                 | System Validation                                                                                                                                                                                            | User Action                                                                                                                                                                                                                                                                 |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stack mode configuration. | Checks if all devices in the selected PAN ID received the stack mode configuration. <ul style="list-style-type: none"> <li>Some devices in the selected PAN ID fail to receive the configuration.</li> </ul> | <ul style="list-style-type: none"> <li>Push stack mode again for the selected PAN ID.</li> </ul> or <ul style="list-style-type: none"> <li>Remove the devices that are in Down state from FND and again push stack mode for the remaining devices in the PAN ID.</li> </ul> |
|                           | <ul style="list-style-type: none"> <li>If all the devices in the selected PAN ID received the stack mode configuration, then you can schedule the devices for stack switch operation initiation.</li> </ul>  | <a href="#">Scheduling Devices for Wi-SUN Stack Switch, on page 28</a><br><b>Note</b> You can schedule the devices for Wi-SUN stack switch only on successful completion of pushing stack mode configuration to all devices in the selected PAN.                            |

- b) On successful completion of the validation, the stack operation state for the selected PAN ID changes to **Stack Mode Push Completed**.

## Scheduling Devices for Wi-SUN Stack Switch



**Note** You can schedule devices for the Wi-SUN stack switching process only on successful completion of pushing devices to stack mode. For more information on pushing devices to Wi-SUN stack mode, see [Pushing Devices to Wi-SUN Stack Mode, on page 26](#)

To schedule devices for Wi-SUN stack switch:

**Step 1** Choose **CONFIG > Firmware Update**.

**Step 2** From the **Stack Mode Switch** table, check the **PAN ID** check box.

**Note** You can select only the PAN ID that has successfully completed the push stack mode configuration.

**Step 3** Click **Push StackMode Time**.

A **Confirm** dialog box appears to schedule the switching initiation process for moving CG-Mesh devices to Wi-SUN stack.

Based on the status of the stack mode time process, the following states are displayed for the selected PAN ID in the **Stack Mode Switch** table.

Table 7: PAN ID Status

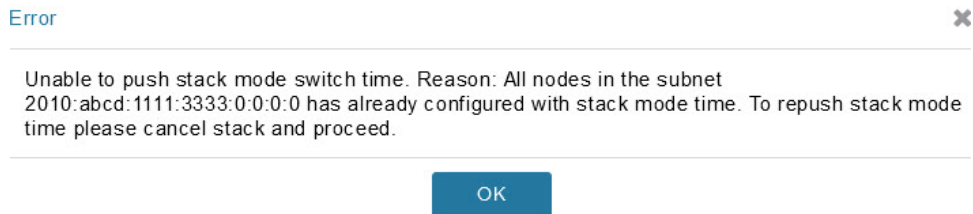
| Field                         | Description                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stack Operation Type Column   | Displays the following states for the stack mode time operation: <ul style="list-style-type: none"> <li>• <b>Stack Switch Time Push Initiated</b> — Denotes the scheduling of the stack switch time operation.</li> <li>• <b>Stack Switch Time Push Completed</b> — Denotes the completion of the stack switch time operation.</li> </ul> |
| Stack Operation Status Column | Displays the overall success and failure status of the devices for the selected PAN during the stack mode time operation.                                                                                                                                                                                                                 |

**Note** The **Devices** tab displays the status of the stack mode time operation at the device level. For more information, refer to [Viewing Stack Mode Information for Devices, on page 31](#).

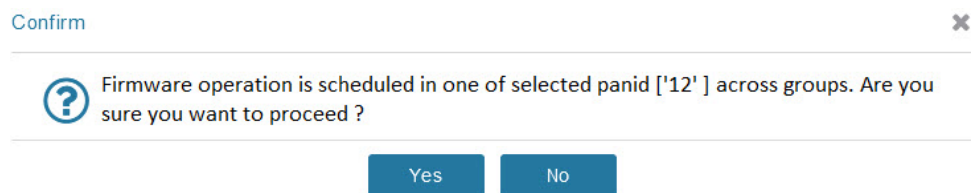
**Step 4** Click **Yes** to confirm the stack switching operation.

On confirming the stack switching process, the stack operation type gets updated to **Stack Switch Time Push Initiated** state for the selected PAN ID.

**Note** The following message appears if you push stack mode time to the node that is already configured with stack mode time.



The following message appears if you push stack mode time for the node that is already scheduled for firmware operation.



**Step 5** In the **Schedule Switch Wi-SUN Stack** dialog box, select the time and click **Schedule**.

**Note** Ensure that the scheduled time is not more than 49 days from the current date.

**Note** If the scheduled time is in the past, an error message appears.

**Step 6** Click **OK** in the **Success** dialog box.

On successful completion of the stack switch process, the stack operation type column in the table gets updated to **Stack Switch Time Push Completed** state for the selected PAN ID.

**Note** We recommend that you wait until all the devices in the selected PAN get switched to Wi-SUN stack, as there is a possibility of some devices failing to switch in the scheduled time. However, the failed devices automatically switch to Wi-SUN stack mode after a one-day time period.

**Note** If you want to reschedule the stack time for some reason, then you have to cancel the current stack switch operation, push the stack mode again, and reinitiate the scheduling stack switch process.

## Cancelling Wi-SUN Stack Switch Operation

You can cancel the Wi-SUN stack switch operation only on successful completion of the previously configured or scheduled stack mode operation.

To cancel Wi-SUN stack switch operation:

**Step 1** Choose **CONFIG > Firmware Update**.

**Step 2** In the **Firmware Management** page, check the **PAN ID** check box for which you have completed either configuration or scheduling operation.

**Step 3** Click **Cancel StackMode**.

Based on the status of the stack mode cancellation process, the following states are displayed for the selected PAN ID in the **Stack Mode Switch** table.

**Table 8: PAN ID Status**

| Field                         | Description                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stack Operation Type Column   | Displays the following states for the cancel stack mode operation: <ul style="list-style-type: none"> <li>• <b>Stack Mode Cancel Initiated</b> — Denotes the initiation of the stack mode cancellation process.</li> <li>• <b>Stack Mode Cancel Push Completed</b> — Denotes the completion of the stack mode cancellation process.</li> </ul> |
| Stack Operation Status Column | Displays the overall success and failure status of the devices for the selected PAN during the cancel operation.                                                                                                                                                                                                                               |

**Note** The **Devices** tab displays the status of the cancel stack mode operation at the device level. For more information, refer to [Viewing Stack Mode Information for Devices, on page 31](#).

**Step 4** Click **Yes** to cancel the stack switch operation.

A **Success** dialog box appears to indicate the successful cancellation of the Wi-SUN stack switch operation.

## Viewing Stack Mode Information for Devices

From the **Devices** tab, you can view the stack mode status and stack mode time of each device for the following processes:

- Pushing Devices to Wi-SUN Stack Mode
- Scheduling Devices for Wi-SUN Stack Switch
- Canceling Wi-SUN Stack Switch Operation

- Step 1** Choose **CONFIG > FIRMWARE UPDATE > Groups** tab.
- Step 2** Select the default or user-defined firmware group from the **ENDPOINT**.
- Step 3** Select the **PAN ID** from the Stack Mode Switch table.
- Step 4** Click the **Devices** tab.

The table displays stack mode configuration status and stack mode time at the device level.

| Stat... | Name             | IP Address                              | Firmware Version  | Backup Version | Uploaded Version  | Boot Loader Vers... | Th... P... V... | IDx Firm. Ver... | IDx Upd. Ver... | Me... By... | Mesh Protocol | Activity           | Update Progress | Stack Change Status        | Scheduled StackModeTime | Last Firmware Status Heard | Scheduled Reboot Time       | Error Message |
|---------|------------------|-----------------------------------------|-------------------|----------------|-------------------|---------------------|-----------------|------------------|-----------------|-------------|---------------|--------------------|-----------------|----------------------------|-------------------------|----------------------------|-----------------------------|---------------|
|         | 0017380501E0049  | 2111.abcd:0:0:7587:9:ha:4a50:60da       | 6.3(6.3.20)       |                |                   | 1.0.5               |                 |                  |                 | No          | Wi-SUN 1.0    | Partially Uploa... | 0%              | Not Started                |                         |                            |                             |               |
|         | 2ED02DFFF6E06F1  | 2091.abcd:1111:2222:88ab:bb:5c:17:3e46  | 6.2weekly(6.2.31) | 6.1(6.1.27)    | 6.4(6.4.17)       | 1.0.6               | 1.4.1...        |                  |                 | Yes         | Pre Wi-SUN    | Fully Uploa...     | 100%            | Canceling StackMode Switch | 2022-04-28 02:14:13     | 2022-04-21 01:00:00        |                             |               |
|         | 0017380500320038 | 2091.abcd:1111:2222:5b8c:a50f:5994:c32e | 6.2weekly(6.2.31) | 6.4(6.4.18)    | 6.2weekly(6.2.31) | 1.0.5               |                 |                  |                 | No          | Pre Wi-SUN    | ERROR              | 0%              | Cancelled StackMode Switch | 2022-04-27 20:18:57     |                            | Incompat... file imageha... |               |
|         | 0017380600420051 | 2091.abcd:1111:2222:c0f2:a2a9:830a:2319 | 6.2(6.2.21)       |                |                   | 1.0.5               |                 |                  |                 | Yes         | Pre Wi-SUN    | ERROR              | 0%              | Not Applicable             | 2022-04-27 16:27:38     |                            | Incompat... file imageha... |               |
|         | 0017381700450024 | 2091.abcd:1111:2222:68d2:d811:281d:16bd | 6.2(6.2.21)       |                | 6.2(6.6.0)        | 1.0.6               | 1...            |                  |                 | Yes         | Pre Wi-SUN    | ERROR              | 0%              | Not Applicable             | 2022-04-27 23:21:26     |                            | Incompat... file imageha... |               |

The **Stack Change Status** column displays the following states:

**Table 9: Device State**

| Device State              | Description                                                                        |
|---------------------------|------------------------------------------------------------------------------------|
| Not Started               | Indicates the supported devices that are not initiated for Wi-SUN stack switch.    |
| Not Applicable            | Indicates the devices that are not supported for Wi-SUN stack switch.              |
| Configuring StackMode     | Indicates the devices that are pushed for stack mode operation.                    |
| Configured Stackmode      | Indicates the devices that are successfully configured with stack mode.            |
| Scheduling Stackmode time | Indicates the devices that are scheduled for stack mode switch.                    |
| Success                   | Indicates the devices that are successfully switched from CG-Mesh to Wi-SUN stack. |

| Device State               | Description                                                                           |
|----------------------------|---------------------------------------------------------------------------------------|
| Canceling stackmode switch | Indicates the devices that are scheduled for canceling stack mode switch.             |
| Cancelled stackmode switch | Indicates the devices that are successfully cancelled from switching to Wi-SUN stack. |

### Filtering Options

- a) Click **Show Filter**. The page displays three drop-down lists.
- b) Select the search option from the first drop-down list. For example, if you select Status from the first drop-down list, the available list of states appears in the third drop-down list.
- c) Select the required option in the third drop-down list and click +.  
Your selection is displayed in the text box above the drop-down lists.
- d) Click the search icon.  
The table displays information based on the search criteria set by you.

## Viewing Logs for Wi-SUN Stack Switch

To view logs for Wi-SUN stack switch:

- Step 1** Choose **CONFIG > Firmware Update**.
- Step 2** Select the firmware group from the **ENDPOINT** in the left pane.
- Step 3** In the **Firmware Management** page, select the **PAN ID** for which you want to see the logs.
- Step 4** Click the **Logs** tab.

In the **Logs** page, you can view the events that are recorded for the selected PAN ID.



| Last Updated        | Address                                 | Multi... | Event Type                 | Message                                                            |
|---------------------|-----------------------------------------|----------|----------------------------|--------------------------------------------------------------------|
| 2022-03-22 01:10:41 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Canceling StackMode Switch | Canceling stack mode switch for subnet 2091:abcd:1111:2222:0:0:0:0 |
| 2022-03-22 01:10:41 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Cancelled StackMode Switch | Cancelled stack mode configuration from device.                    |
| 2022-03-22 01:10:41 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Canceling StackMode Switch | Canceling stack mode switch for subnet 2091:abcd:1111:2222:0:0:0:0 |
| 2022-03-22 01:10:41 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Cancelled StackMode Switch | Cancelled stack mode configuration from device.                    |
| 2022-03-22 01:09:09 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Scheduling StackModeTime   | Scheduling stack mode time for subnet 2091:abcd:1111:2222:0:0:0:0  |
| 2022-03-22 01:09:09 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Success                    | Stack mode time configuration sent to device.                      |
| 2022-03-22 01:09:09 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Scheduling StackModeTime   | Scheduling stack mode time for subnet 2091:abcd:1111:2222:0:0:0:0  |
| 2022-03-22 01:09:09 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Success                    | Stack mode time configuration sent to device.                      |
| 2022-03-22 01:07:11 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Configuring StackMode      | Configuring stack mode for subnet 2091:abcd:1111:2222:0:0:0:0      |
| 2022-03-22 01:07:11 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Configured StackMode       | Stack mode configuration sent to device.                           |
| 2022-03-22 01:07:11 | 2091:abcd:1111:2222:fde6:670f:73c8:eece | no       | Configuring StackMode      | Configuring stack mode for subnet 2091:abcd:1111:2222:0:0:0:0      |
| 2022-03-22 01:07:11 | 2091:abcd:1111:2222:88ab:bb:5c17:3e46   | no       | Configured StackMode       | Stack mode configuration sent to device.                           |

## Viewing Audit Trail for Wi-SUN Stack Switch

To view audit trail for Wi-SUN stack switch :

**Step 1** Choose **ADMIN > System Management > Audit Trail**.

**Step 2** In the Audit Trail page, click the **Date/Time** drop-down arrow to filter the audit trail based on the date and time. You can view the audit trail of the stack operations that were performed on the selected PAN ID.

|                     |      |      |             |                             |           |                                                                             |
|---------------------|------|------|-------------|-----------------------------|-----------|-----------------------------------------------------------------------------|
| 2022-02-24 11:34:59 | root | root | 10.65.78.18 | Stack Mode Push             | Initiated | Stack Mode Push Operation , Device Category: endpoint, For PANID [7]        |
| 2022-02-24 11:26:12 | root | root | 10.65.78.18 | Cancel Stack                | Initiated | Cancel stack mode push operation , Device Category: endpoint, For PANID [7] |
| 2022-02-24 11:22:25 | root | root | 10.65.78.18 | Scheduled Stack Switch Time | Initiated | Stack switch time push operation , Device Category: endpoint, for PANID [7] |
| 2022-02-24 11:18:28 | root | root | 10.65.78.18 | Cancel Stack                | Initiated | Cancel stack mode push operation , Device Category: endpoint, For PANID [7] |
| 2022-02-24 10:49:04 | root | root | 10.65.78.18 | Stack Mode Push             | Initiated | Stack Mode Push Operation , Device Category: endpoint, For PANID [12]       |

## Upgrading Firmware Image during Bootstrapping

During bootstrapping, you can enter a different image if the installed image at manufacturing is inappropriate. This is supported for IR1800 and IR8100 devices from the versions 17.13.01 and above. Plug and Play (PnP) must be supported on these devices.



**Note** Ensure that IR8100 device has the network-essentials license to register the device to IoT FND.

PnP Device Information service retrieves current firmware version on the device and the PnP ImageInstall service performs the image installation. The CGNA 'image-retrieve' service transfers the image file from IoT FND to router.

- Step 1** Set the `firmware-update-bootstrap` property in `cgms.properties` to 'true'.
- Step 2** On the Tunnel Provisioning Page, navigate to **CONFIG > TUNNEL PROVISIONING > ROUTER BOOTSTRAP CONFIGURATION**.
- Step 3** Select the device group in the left pane, choose the Target Firmware Version from the drop down that lists the images in IoT FND, and click **Save**.

The PnP workflow configures the device to load the new image upon the next reload by executing the `boot system` command. The configuration changes are saved on the device. The PnP reload happens and sends a message to the PnP server after which an event is generated denoting image installation.

The screenshot shows the Cisco IoT Field Network Director interface. The breadcrumb navigation is **CONFIG > TUNNEL PROVISIONING**. The page title is **default-ir8100**. There are tabs for **Group Members**, **Router Tunnel Addition**, **HER Tunnel Addition**, **HER Tunnel Deletion**, **Router Bootstrap Configuration** (active), **Reprovisioning Actions**, **Policies**, and **Bootstrapping**. The **Router Bootstrap Configuration** tab is active, showing a configuration pane with the following content:

```

Revision #8 - Last Saved on 2024-03-05 03:13
Target Firmware Version:
ir8100-universalk9.17.13.01a.SPA.bin
No target firmware image
ir8100-universalk9.17.13.01a.SPA.bin
ir8100-universalk9.17.12.02.SPA.bin
+
boot system bootflash:/managed/images/ir8100-universalk9.17.13.01a.SPA.bin
+
+
+
hostname $(sn)
+
+
aaa new-model
+
+
aaa authentication login default local
aaa authorization exec default local
+
+
aaa session-id common
aaa password restriction
+
+

```

**Note** The PnP workflow supports device upgrade only if the target image version is higher than the running (current) image version.

If the target image runs the same or lower version, then the device upgrade is skipped during the PnP workflow.

During PNP, you also have the option to skip the firmware upgrade and proceed with PNP if the source operating system on these devices is found to be unreliable. Enter the image versions as comma separated values in **`pnp-skip-update-ios-xe-fw-versions`** property in `cgms.properties` file. This property is applicable for all IR1100, IR1800, and IR8100 devices. For more information, see [Skipping Firmware Upgrades during PNP, on page 34](#).

## Skipping Firmware Upgrades during PNP

During Zero Touch Deployment (ZTD), certain scenarios may arise where Plug-and-Play (PNP) devices come bundled with software that exhibits instability or issues. If the source operating system (OS) on these devices is found to be unreliable, it can potentially disrupt the entire registration process. In such instances, during the PNP process, you can skip the firmware upgrade step while allowing PNP to proceed seamlessly. However, you can upgrade the firmware once the PNP process is complete.

To perform a PNP with firmware upgrade skip:

**Step 1** Set the image versions in pnp-skip-update-ir1100-fw-versions property in cgms.properties file.

**Note** The pnp-skip-update-ir1100-fw-versions property is applicable for IOS-XE routers only.

**Step 2** Set the image versions in pnp-skip-update-ios-xe-fw-versions property in cgms.properties file.

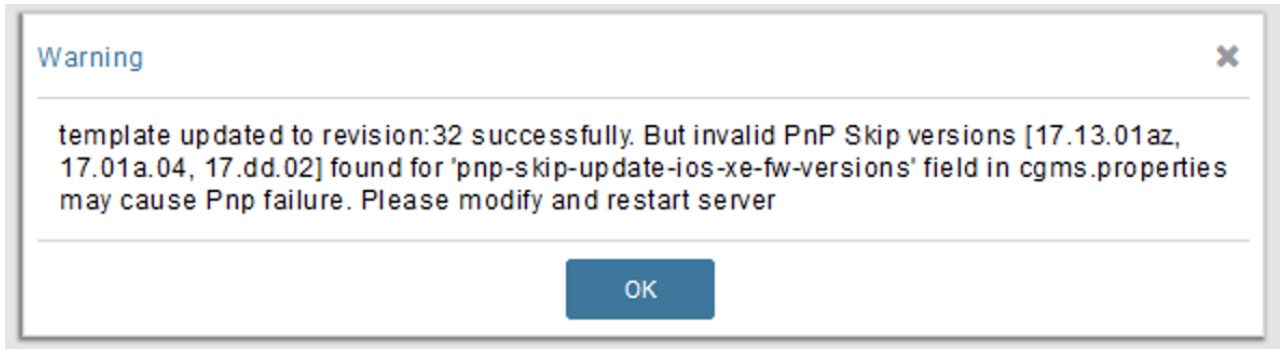
**Note** The pnp-skip-update-ios-xe-fw-versions property is applicable for IOS-XE routers only.

**Step 3** Choose **CONFIG > Tunnel Provisioning**. Select the router group for which you intend to execute the PNP process.

**Step 4** Click **Router Bootstrap Configuration** tab.

**Step 5** Under Target Firmware Version, specify the image version you want to skip and click **Save**.

The template is saved. However upon performing PNP, during router bootstrap configuration, a warning popup appears if any invalid entry is found. In that case, modify the field and restart server.

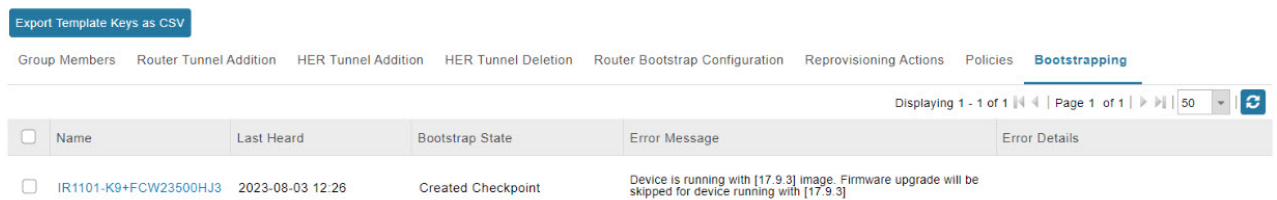


If firmware install is skipped during PnP process, the log details are stored in server.log file. The sample INFO log is shown below:

```
Aug 03 2023 19:24:26.854 +0000: %IOTFND-6-UNSPECIFIED:
%[ch=WorkResponseHandler][eid=IR1101-K9+FCW23500HJ3][ip=1.1.1.121]
[sev=INFO][tid=tunnelProvJetty-67]: Retrieved device image version
[17.9.3] is present in PnP firmware image skip list. Firmware image update
during PnP process will be skipped.
```

**Note** In order to upgrade the device with the latest firmware version, skip entering the current image version in cgms.properties and proceed with PNP.


**Step 6** Navigate to the Bootstrapping tab where the Error Message field is updated though the PNP progresses as is.



The Bootstrapping tab shows the status of the PNP under the Bootstrap State field.

## Skipping Firmware Upgrades during PNP

Group Members Router Tunnel Addition HER Tunnel Addition HER Tunnel Deletion Router Bootstrap Configuration Reprovisioning Actions Policies **Bootstrapping**

Displaying 1 - 1 of 1 | Page 1 of 1 | 50 | 

| <input type="checkbox"/> | Name                  | Last Heard       | Bootstrap State                                        | Error Message | Error Details |
|--------------------------|-----------------------|------------------|--------------------------------------------------------|---------------|---------------|
| <input type="checkbox"/> | IR1101-K9+FCW23500HJ3 | 2023-08-01 18:38 | Installing Firmware Image<br>(Trigerring Installation) |               |               |